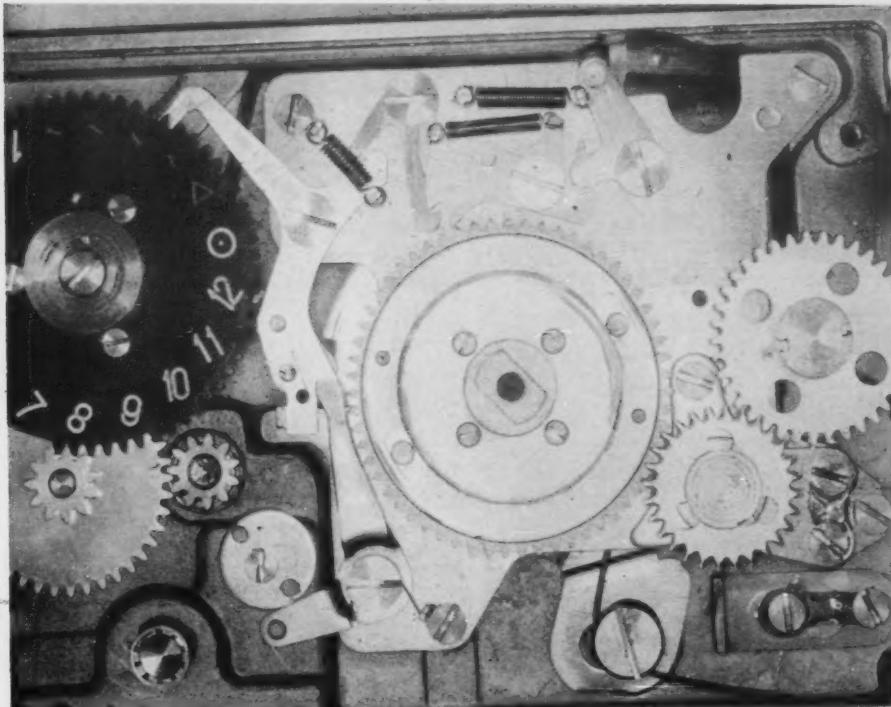


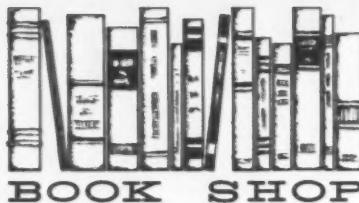
VOLUME 7
NUMBER 2
MAR-APR 1961
35¢ A COPY

the

CAMERA CRAFTSMAN



In this issue:
DR. LAND
VOIGTLANDER



BOOK SHOP

Here are useful additions to your library of technical material. This department will regularly offer suggestions for new books you may wish to acquire. Any reference books, whether or not here listed, photographic or otherwise, will be located for you and may be purchased through National Camera Servi-Shops Supply, Box 174, Englewood, Colorado.

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PHOTOGRAPHIC OPTICS By Arthur Cox	5.75
PHOTOGRAPHIC OPTICS By Allen R. Greenleaf	6.00
PRINCIPLES OF OPTICS By Hardy and Perrin	9.50
CAMERA REPAIRMAN'S HANDBOOK	5.95
KODAK REFERENCE HANDBOOKS	ea 4.00
MINIATURE AND PRECISION CAMERAS By S. J. Lipinsky	7.95
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HOW TO INSTALL AND SERVICE INTERCOMMUNICATIONS SYSTEMS By Jack Darr	3.00
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ABC'S OF CAMERA REPAIR By S. L. Love	3.95
BASIC ELECTRICITY By Van Valkenburgh, Noeger, Neville, Inc. 5 vols. \$2.25 each Hard bound edition	set 10.00 11.50
PHOTOGRAPHIC LENS MANUAL By C. B. Nablette Paper bound Cloth bound	1.95 3.50

the

CAMERA CRAFTSMAN

VOLUME 7
NUMBER 2

MAR-APR 1961

The Periodical of Photo
Technology for Camera
Repairmen

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THIS MONTH'S COVER

SECTION OF WIND MECHANISM IN MINOLTA
AUTOCORD

STAFF

Fred Platts	Editor
Clair H. Schmitt	Technical Advisor
Darwin Miner	Art Director
Frank H. Curtis	Advertising Consultant
John Goldsmith	Production Manager

A Point to Ponder

By SAMUEL L. LOVE



Whenever you are talking about or working in a technical field, there is a word that seems to come in for more than its share of use--and abuse. The word is "Precision." We are accustomed to reading every day of the precision needed to fire a missile and hit a target 5,000 miles from the launching pad; or strike an object like the moon - 250,000 miles away. Certainly, the space age has made everyone more aware of what precision can mean.

There are still many levels of precision. Just how accurate is accurate?

There is nothing so easy to say as "exactly." But everyone has their own idea of what "exactly" means! If a housewife reads that she is to use exactly one cup of milk or notes that something is exactly one inch long, there is little question in her mind about how much or how long. If a plumber puts "exactly" one inch of thread on the end of a pipe, he also knows what he is talking about. When a cabinet-maker planes a board so that it is "exactly" one inch thick, he is sure, also. But a precision tool maker might wonder just how thick that board is, for he knows how difficult it is to grind a block of steel "exactly" one inch high. A gauge maker could easily ask what purpose the one inch thick block is to serve, while the scientist might query, "at what temperature?"

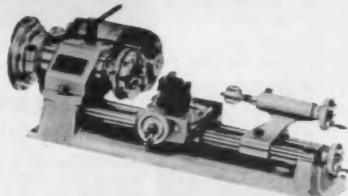
For it is a fact, that nothing can be exactly one inch thick. There would be no way to prove it, if it were! There must always be some "tolerance." A seamstress might measure her one inch bias tape with a measure that is also made of cloth. The carpenter's rule might have graduations of 1/32 of an inch but rulers are rather flexible things. A machinist with his micrometer and dial indicator could be confident he is working within a few ten thousandths of an inch, but the gauge maker or the lens grinder might measure with light waves to within a few millionths of an inch.

So the accuracy or precision to which anything is made, often depends on the accuracy of the measuring stick that is used. An inch is

Cont. page 4

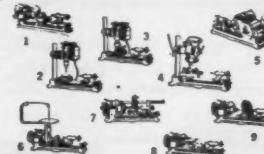
UNIMAT

Unimat is a precision tool designed for technicians and engineers. It's ready-made for Camera Craftsmen. No bigger than a typewriter, Unimat is a combination of 10 tools in 1, operating on just one base. Widely acclaimed as the finest tool ever developed for machining small parts made of metal, wood or plastic, Unimat is a rugged, portable machine that will provide a lifetime of satisfaction.



Basic unit consists of the precision lathe and all components necessary to set up drill press, milling machine, tool and surface grinding machine, hand drill, grinding and polishing machine. Also includes motor, upright steel drill press post, universal 3 jaw (reversible) self centering Cushman type lathe chuck, 3 jaw Jacobs type 1/4" capacity drill chuck, pivoting tool post, 2 dead centers, Face plate, lathe dog, grindstone arbor, Allen wrench, easy to follow instruction manual. Unimat basic unit comes handsomely packaged in sturdy wood storage chest. Complete basic unit, priced \$129.50

Items 1 through 5 are included in the basic unit. Items 6 through 9 are accessories. Write for illustrated literature and price list.



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A Complete SHEET METAL SHOP For Less Than \$20 Per Unit!

18° Bending and Forming Brake

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- * Box-brake Slots
- * Easy Adjustments
- * Handles up to 16 ga. stock

Fantastic low price makes it easy for you to have a well equipped shop!



Notching and Nibbling Unit

- * Available with 1 x 1" 90° Notch Die or 1 x 3/4" Nibbling Die
- * Dies easily interchanged

Indispensable at this low cost for rush and special jobs! — Makes accurate burr-free notches.

Mod. N-Notching Unit** Mod. N2-Nibbling Unit
Either die separately --- \$8.00

4 in 1 Tool

- 1. Punches 2. Forms
- 3. Shears 4. Rivets
- * Throat depth handles up to 1" width, 16 ga. stock
- * Stationary die plate eliminates danger of damage to the punch and work.

Round out your repair department sheet metal shop with this versatile low-cost tool!

FORM — smooth, sharp bends to 90° — metal rods or bars!

RIVET — any type of solid or hollow rivet!

PUNCH — 1/3", 5/32", 3/16", 1/32", and 1/4" round burr — free holes up to 1" from edge.

SHEAR — 16 ga. metals at any angle; takes rod & wire tool



NATIONAL CAMERA ServiShops

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Point to Ponder cont. from page 3
only as "exact" as your measuring devices will indicate!

A camera repairman works with many tolerances. You are concerned with mechanical dimensions, torsion, friction, time, electrical values, optical aberrations and more.

Your customer also is familiar with tolerances. He can miss his film speed or exposure to a greater or lesser degree depending on his quality standards. Developing time, temperature, density and contrast; may all be variable within differing degrees.

The important thing that you must remember is that each tolerance — each variation demands a different kind of measuring accuracy. If you measure a distance to the nearest inch, your measuring instrument need not be more accurate than within a tenth of an inch. If you want to measure that inch within a thousandth, your measuring instrument should be accurate within two or three ten thousandths of an inch. Invariably, the measuring device should be from three to ten times as accurate as the tolerance which you permit. If you want to measure a shutter speed which has a tolerance of twenty per cent, for example, your instrument should be accurate within two to five per cent. If you want to measure a shutter speed to an accuracy of five per cent, your instrument must be precise within one per cent.

Look around you. Everything you work with has some sort of tolerance allocated to it. How clean is a "clean" shutter? How uniform is a seven second recycling time? How even is "even" screen illumination? How can you apply more "precision" to your work? 

According to G. G. Newman, there are three kinds of creative people -- Idea men, Developers, and Communicators, but all share these ten characteristics: 1. Basic Health. 2. Sensitivity (or a heightened awareness of everything and everybody.) 3. Tolerance of ambiguity (ability to produce and advance even when he doesn't know everything that's going on). 4. Flexibility. 5. Drive. 6. Persistence. 7. Motivation to change the environment or relationship of self to environment. 8. Ability to find a new coordinating principle or symbol. 9. Ability to abstract. 10. Lack of repressive defenses (his "boundaries" are open to inspiration both from within and without.)



Reports FROM THE CRAFTSMEN

Business has been too good here lately. I have been working late every night, including weekends, and I still have at least a three day back-log of repairs.

Glenn E. Gale
Big Springs, Texas

Just a few lines to let you know how I'm getting along in my repair business. I have taken in about ten cameras of quite a few makes and sizes. The School has helped me a lot this far, and I am looking for better things to come. I am always anxiously awaiting the arrival of new lessons. I greatly appreciate your evident interest in my work.

Robert J. Miles
Woodland, California

I am glad that I decided to take the National Camera Repair School Course. The lessons are interesting and the work, or practice material is very good. Even though I'm only about half way through the course, I have learned things that have helped me sell cameras better and the customer seems to put more faith in my words.

Before taking this course I didn't know that there could be so many different shutters and how each works. This information helps when you are trading cameras with a customer. The confidence I have now gained in opening a shutter is worth the price of the course.... The tools I have received are wonderful and they are very useful. I have the National Camera Repair School to thank for a job I got here, at the hospital.

The hospital has a rented camera to take baby pictures with. About a week ago the hospital called and asked me to come out... the camera would not work. I was able to fix it and they told the camera company's representative. He contacted me and when I told him about the Camera Repair School he showed me how to service and check the camera and I'm to send my bill to the company whenever I service the camera. As of now, I have had two service calls to the hospital. I could go on with more things that the school has done for me but I'll write again.

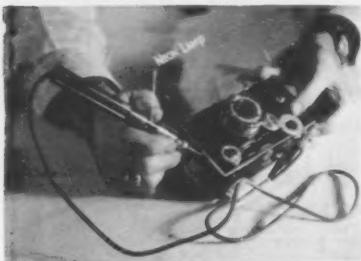
William Haynes
Wilmington, Ohio

SYNCHRO CONTACTS P.C. 3 mm			Price
	to be riveted into shutter	SCR 1	.75
	metric shutter thread M 4 contact pin 1/8" long	SCR 2	.75
	metric shutter thread M 4 contact pin 1/8" long metric screw M 1.4	SCR 3	1.45
	metric shutter thread M 4 x 0.5 metric screw M 1.4	SCR 4	1.25
	metric shutter thread M 4 x 0.5 metric screw M 1.4	SCR 5	1.25
	for small and large Compur shutters metric shutter thread spring 1/8" long metric screw M 1.4	SCR 6	2.10
	for Bellowsflex-Automatic etc. spring 1/8" long wire 4" long metric screws M 1.4 black leather plate	SCR 7	2.10
	for Rolleiflex, old Rolleiflex, Bessamatic etc. spring 1/8" long with 2 mounting plates wire 4" long metric screws M 1.4 black leather plate		
REPAIR PLUGS			
	to be glued by acetone or benzol. Contact pin silver plated. Directions for use added.		
	End Plastic		
	P.C. 3 mm male black	SCR 13	.30
	ivory	SCR 14	.30
	P.C. 3 mm female black	SCR 15	.75
	ivory	SCR 16	.75
	double prongs (U.S. household plug)	ivory	SCR 17 .45
REPAIR LEADS			
	P.C. 3 mm 1/2" long, ready for mounting		
	End Plastic		
	P.C. 3 mm male black	SCR 18	.35
	ivory	SCR 19	.35
	double prongs (U.S. household plug)	ivory	SCR 20 .50

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• • •

An easy to use, inexpensive electric circuit tester especially adaptable for camera repair work. It is capable of locating and identifying dead or live circuits of any voltage, fast.

- Checks electric photo-flash circuits
- Analyzes breaks and high resistance joints
- Tests flash wiring for breaks or bad connections

Put this handy unit into your carryout case or pocket for quick tests anywhere. Tested and approved for camera repair by "National ServiShops"

\$4.50



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B*IRTHdays!

Robin Lea Carter, born Jan. 20, 1961 at 11:12 p.m., weighed in at 7 lbs. 11 oz. Mr. and Mrs. C. R. Carter, Mitchell, Indiana, are her proud parents.

A son, Robert Warren Wilson, was born to Mr. and Mrs. Dick Wilson of Knob Noster, Missouri, on the 18th of August. He weighed 6 lbs., 3-1/4 oz.

A future Camera Craftsman was born 29 Jan., 61 and named Mitchael Leslie Krooss. He weighed 6 lbs. 1-1/2 oz. and was 18-1/2 inches tall. Small but cute. Sp4 Warren A. Krooss, APO 731 Seattle, Washington is the proud father.

Carl and Mary Thatcher of Creston, Iowa announce the birth of a son, George W. Thatcher. Vital Statistics: 9 lbs., 12 oz.

SHORTAGE OF SKILLS

For U.S. industry, the rise in unemployment to new highs... underlined a startling paradox: all around the nation, even in such critical jobless areas as Detroit, jobs are going begging for lack of skilled workers to fill them. Industry is hard put to find enough trained craftsmen, but the problem is getting worse. For every 100 skilled workers that the nation had in 1955, it will need 122 in 1965 and 145 in 1975. Yet the nation's spotty training programs are not even turning out enough new craftsmen to replace those who retire. Automation and such new industries as electronics have vastly increased the demand. What can industry do to fill it?

A number of companies have tried apprentice programs. They put high school graduates through paid training programs in their shops and send them to school several hours a week for classroom studies. Companies such as General Electric, General Motors, Ford and International Harvester try to get the top graduates from high schools and give them an engineering education that comes close to what they would get in college. Entrance requirements are high. Harvester says it turns down nine out of ten who apply. Applicants who are admitted get a four year course in advanced mathematics, hydraulics, electronics and similar subjects--plus training in the shop. The program pays off: 75% of the students who took the course are still with the company.

Cont. page 7

Shortage of Skills, cont. from page 6

But such programs will train only one-tenth of the craftsmen needed for the '60s. The Government supervised widespread apprentice programs right after World War II but enrollment has dwindled from 400,000 to 160,000. In industrial Massachusetts, where the need for skills is vital, the Labor Department's regional director of apprentice training, Hubert Connor, has only 4,000 in his apprentice programs. "That's terrible," he says. "We should have 18,000. Industry and labor don't seem to realize the tremendous need that exists now, and will exist in the future for skilled help." -from *Time*, Mar. 10, 1961

TURN "BOUNCES" INTO GOOD WILL

A six-step tested formula for handling customer complaints is: (1.) Sympathize with the customer-try to put yourself in the customers position. (2.) Reassure the customer that you will do something about the problem. (3.) Find out exactly what's wrong. (4.) Personalize the problem. (5.) Rebuild your reputation. (6.) Thank the customer.

This procedure is built on logic. When a customer complains, he's angry, and he expects resistance. When you sympathize instead, you rob him of his big offensive weapon-anger. Now you have him wondering. You reassure him in order to rid him of his fear.

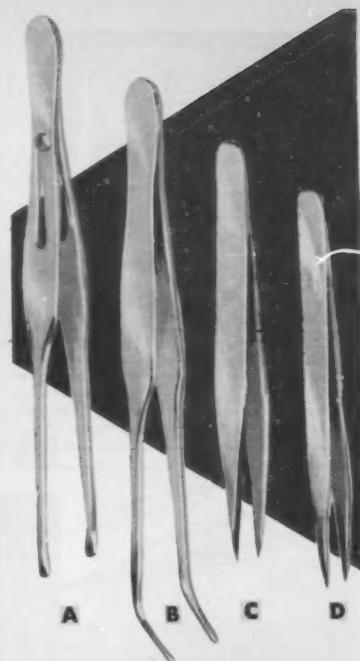
When he came into the store, he was afraid you'd do nothing to rectify the error. By assuring him that you will, even before he gets a chance to ask you, you win him to your side.

Finding out what's wrong forces the customer to be specific. Instead of being permitted to say, "Your work is no good," he has to pin-point the fault. Usually, it's a small one, and he'll feel better if he realizes everything isn't wrong.

When you personalize the error, you help him realize that the whole company isn't at fault, but only one employee. A customer can forgive a person far more easily than a "company" or "business."

Rebuild your reputation by reminding him that you may have made a mistake this time, but not the other 99 times.

Finally, make him feel good by thanking him. By this time, he's feeling a little guilty for causing all the fuss. Don't let him feel guilty. Rebuild his ego. Tell him he's done you a favor by letting you know where you slipped, so that it won't happen again. With this final touch, he's your friend.



RENARD TWEEZERS

Designed for working with small parts in tight places, Where you can't use your hands. Swiss made, long lasting, chrome plated.

A-Soldering	-----	.85.
B-Clock	-----	.58
C-Assembly	-----	.85
D-Work	-----	.30

All Sizes Available

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Now packaged in convenient 7cc applicator guns, NCRS Supply has two of the finest instrument lubricants available. Use All-Temp Lube for sliding levers and similar friction points. Use Moly Lube on motion picture camera springs.

All-Temp Lube _____ .60

Moly Lube _____ .70



Fine instrument lubricants are now packaged by NCRS in 5cc disposable syringes. Keeping oil clean yet instantly available for pin-point application, these containers are perfectly suited to bench technicians.

5cc Instrument Lubricant _____ .55



SHINO Polishing Cloths

Two cloths - one with jewelers' rouge, the other for final polishing. Comes in cardboard box. 11-1/2" x 14" size. Each _____ .75



Non-corrosive, resistant to temperature change, this Porpoise Jaw oil product stays at the point of lubrication.

3/8 oz. bottle _____ .75

Congratulations TO NEW NCRS GRADUATES

Graduation time represents the culmination of studies completed over a period of from one to three years. In many cases this achievement was made under heavy pressures from regular job and family responsibilities. All of these NCRS graduates deserve the highest praise for the diligent attention and unflagging work that went into their course of training.

John R. Richards

Beauford J. Moen

Charles Wittman

Tom Kamihira

Ted Kulik

Carl D. Thalheim

Paul Heiselman

Cosler A. Mitchell

George E. Kohlhass

Walter Kalina

C. Kenneth Coons

California

Ohio

New Jersey

Pennsylvania

Canada

Michigan

Ohio

California

New York

New Jersey

New York

Certificate of Completion:

Myles W. VanDuzer

Illinois

I never thought that "NCRS" would be my real Alma Mater until I visited it and enjoyed practical work. I worked in your shop which is perfectly equipped with all necessary instruments to check every phase of camera repair work.

I saw the business of a camera repair shop in its daily operation with all the paper work and the other little things, and suddenly the theory I learned from text books and the practical application of the learning, took a harmonious shape. I met the personnel, which so patiently guided me through the course, and I was impressed with their expertise in their particular field and above all, I realized that my relationship with NCRS is not ended, but just fruitfully begun.

By expressing my feeling in this letter, I want to share my impressions with all the members of our faculty and with those who will join us in the future.

With a deep appreciation and regard to NCRS, my thanks,

Peter M. Komaroff
Berkeley, California



study shots

HERE IS WHERE NCRS STUDENTS LEARN

These are pictures of students in the shops they have set up for their training in camera repair.



Nelson Loucks
Miami, Florida



Mrs. Albert Portenheimer
Evansville, Indiana



Mr. James T. Thompson
Asheville, North Carolina



Kenneth Brilhante
Tiverton, Rhode Island



B. G. Powell
Trenton, Ontario, Canada



Pete Cambra
Santa Rosa, California



Stephen H. Olley
Schenectady, New York



Richard H. Knight Jr.
Knoxville, Tennessee



Derlef H. Sommerkamp
Rochester, Minnesota

VOIGTLANDER Produces

Lens No. 5,000,000

In 1840, a year after the daguerreotype principle was made known in Paris, Joseph Petzval, a Viennese mathematics professor, worked out the world's first mathematically computed photographic lens and Peter Wilhelm Friedrich Voigtländer made it in his Vienna workshop.

January 1961, the Voigtländer plant in Braunschweig produced lens number 5,000,000, a historic achievement. The lens is a Color-Skopar X for the company's Bessamat camera, but it will not be attached to a camera. It has been placed in the item's museum as part of its history.

When, in August, 1839, the invention of photography was announced in the Académie Française in Paris by President Arago, the entire world was interested in this sensational development. Viennese Professor von Ettinghausen was among the audience and, upon his return home, reported to the Austrian government and his colleague Petzval in detail about the daguerreotype.

Slow Speed Poses Problem

Both recognized that the poor speed of the lenses available at the time was the weak point of the invention. The lens made by Ch. Chevalier and used by Daguerre in his camera had only a relatively small aperture of f/16 and required a 15-minute exposure time.

Petzval immediately turned to Peter Wilhelm Friedrich Voigtländer, grandson of the founder of the Voigtländer workshops in Vienna, for help in increasing the speed of lenses. This led to the first mathematically computed lens, which required a great amount of arithmetical work based on data about the types of optical glass available at the time.

Petzval requested the help of one of the top commanding officers of the Austrian Army because he knew that soldiers in the artillery had studied mathematics.

The first lens computed was a Petzval portrait lens with the high light-transmitting power (speed) of f/3.7, fantastic for the time. The optical properties of the

lens also were unusually fine. In fact, Petzval-type lenses are still in use. Modern projectors are nearly all fitted with such lenses.

First All-Metal Camera

Voigtländer began developing the first all-metal camera for this lens. The camera had special features for portrait work. The lens could be focused with a pinion and controlled by means of a groundglass screen. The camera could be swivelled and adjusted in height. It was very expensive, however. In 1840, the camera and all accessories cost 120 guilders.

By 1842, some 600 of the complete outfit had been sold. Voigtländer produced, on the basis of Petzval's calculations, not only the lenses for his metal camera but also ground portrait lenses of 6" and even 8" diameters weighing up to and more than 66 lbs. The 6" lens sold for 1,200 guilders, the 8" for about 2,000 guilders. An 8" lens is still in use at the Vienna observatory and is said to be irreplaceable for certain special photographs.

By 1862, Voigtländer had shipped 10,000 lenses. (The plant had been moved to Braunschweig in 1849.) A silver cup, donated by the workers on the occasion, attests to this date.

Lens number 10,000 was "one of the largest kind" produced at that time. The exact type is not known, but it probably was a 6" objective.

Lens No. 30,000 in 1885

In 1885, the Voigtländer workshops produced lens number 30,000, a Eury-skop, a four-element aplanat type calculated by Dr. Hans Zincke-Sommer. For the next half-century, significant numbers were not saluted, but in 1936 a Heliar for professional photography, numbered 1,000,000, was produced and placed in the museum.

Lens number 2,000,000, also a 10" (24-cm.), Heliar, f/5.5, was produced a year later. The tremendous production--1,000,000 lenses in a year--resulted because of the large number of Bessa and Brilliant cameras manufactured then.

No. 3,000,000 was produced in 1947 and No. 4,000,000 in 1956. The former again was a Heliar but with an f/4.5 speed.

Cont. page 13

We are often warned not to waste time, and yet time is something we can neither waste, or save or spend. It is a thing over which we have no control, for it moves onward constantly and inevitably. What we can and do waste is ourselves--what we could do, but don't. The love we do not give; the efforts we do not make; the kindnesses we fail to bestow and the happiness we neglect to earn. No, the waste is not time but the things that could be ours if only we would learn to understand why we are here.

P-K Sideiner
Peter Kunz Co.

There's a lesson for all of us in the story about two shoe salesmen who were sent by their company to a South American country to open new markets. Three days later, there came a cablegram from the first salesman: RETURNING NEXT PLANE. IMPOSSIBLE TO SELL SHOES HERE. EVERYBODY GOES BAREFOOT.

Nothing was heard from the second salesman for two weeks. Then there arrived a fat airmail envelope with the message: TREMENDOUS SALES AHEAD. FIFTY ORDERS ENCLOSED. PROSPECTS UNLIMITED. NOBODY HAS SHOES HERE.

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Here's the triple-threat test instrument that will be equally at home in your shop, store or lab. This investment is planned to earn you profits. Use the prestige-building

ServiShops Motion Analyzer

for fast, high-precision tests on all photo equipment. You'll find it easy to operate, easier to understand and easiest to demonstrate!

Use Kimwipes On your DISPOSABLE WIPES camera bench...



SAFE!
SOFT!
CLEAN!
DISPOSABLE!
NON ABRASIVE!

Kimwipes special design captures grit and dirt in the crepe pockets to protect such highly polished surfaces as camera lenses and binoculars.

4 Boxes...\$1.35

12 Boxes...\$3.45

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Write today for complete
free information.

NATIONAL CAMERA REPAIR SCHOOL Drawer CC Englewood, Colorado



This colorful sign will tell your customers that you want their camera repair work. The sign is done in eye-catching yellow, blue and black on white background. The size is 11" by 14".

A sign for every purpose. Standard heavy board, standard heavy board with easel, and paper that can be taped to any window.

Price each in quantity	1-4	5-9	10 up
Paper	.79	.70	.50
Board	1.00	.80	.55
Board with easel	1.10	.90	.65

May be assorted for quantity price. One sign is FREE, 25¢ in cash or stamps for handling and postage. No handling charge for your free sign if you order more than one.



Now you can keep all of your texts neatly in order. Each text is held securely and the binder may be opened to any page in any text, yet each is instantly removable! Seven inches wide, your binder holds forty texts ready for immediate reference. This is a fine way to preserve your Camera Craftsman-ship lesson books.

Price only \$7.75



If you are not a member of SPT,...

THE NEXT SECTION OF THIS ISSUE IS MISSING

The Society of Photo-Technologists section of the Camera Craftsman is sent only to members of the society. SPT, is an organization of camera technicians and others interested in the more technical aspects of photography. The SPT section contains varied technical material available only to members. Send for a membership application so you won't miss the valuable articles in this section.

Write:

The Society of Photo-Technologists
Box 174
Englewood, Colorado

From photographing the children of Mother Earth who obediently "look at the birdie" to photographing a star 10 billion light years away is the adjustment that the photographic profession must make as it faces the challenge of the Space Age.

Photography plays a vitally important role in the missile, rocketry, and space explorations program, and yet in the past year there weren't enough students graduated from photographic technology schools to satisfy replacement needs or the growing demand.

Ours is a growth industry, and yet we are going into the Challenging Sixties without the technically qualified and trained personnel to people our industry. Compare this with the thousands of graduates of our engineering, medical, architectural and other professional schools. -Joseph H. Snyder, Pres., Color Corporation of America.

That America's inter-continental ballistic missile program was readied 18 months ahead of schedule can be attributed in part to the role played by photography.

As in any other field, photography cannot become static. Along with the progress in America's missile and space programs must come essential improvement in photographic equipment and methods. Like the fragile human being in space, film and cameras will have to be protected against heat, cold, humidity, shock, gravity-force, and radiation. -Carl N. Brewster, Head of Information Services, Space Technology Laboratories, Cape Canaveral, Fla.

SPT

THE SOCIETY OF PHOTO-TECHNOLOGISTS

Measuring ← and Testing ← LENSES ←

Continued from
Jan.-Feb. issue.

We are indebted to Mr. Norman C. Lipton, Photographic Information Service, New York, N. Y.; and Jos. Schneider & Co., Optische Werke, Kreuznach, Germany for what we believe is a very informative article on "Measuring and Testing Lenses." -Ed.

General Case

The refractive index can now be determined: this involves the measurement of the angle by which a parallel bundle of light rays is diverted. In addition, the angle formed by the entrance and exit surfaces must be measured, and also the angles of incidence and exit of the light rays (Fig. 1).

In general cases, the refractive index of a prism can be determined by means of the following formula:

$$n^2 = \left(\frac{\sin \alpha_1 - \sin \alpha_2}{\sin \varepsilon} \right) + \frac{\sin \alpha_1 \sin \alpha_2}{\sin^2 \varepsilon/2}$$

$$\alpha_1 + \alpha_2 = \delta + \varepsilon.$$

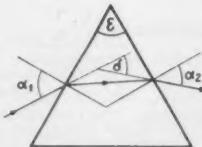


Fig. 1 Measurement of the refractive index of glass from the angle δ , the light ray entering at the given angle of incidence α_1 being 'bent' by the prism.

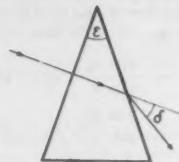


Fig. 2 Measurement of the refractive index of glass from the refraction angle δ , when the ray enters the incidence-surface of the prism at right angles ($\alpha_1 = 0^\circ$).

Here,

α_1 = Incidence-angle of light rays.

α_2 = Exit-angle.

δ = Angle of total deviation.

ε = Prism angle.

Of these 4 angles, 3 must be measured.

The following formula is most suitable for the logarithmic calculation. To start with, employ the equation:

$$\operatorname{tg}(\alpha_1' - \frac{\varepsilon}{2}) = \operatorname{tg} \frac{\varepsilon}{2} \operatorname{ctg} \frac{\varepsilon + \delta}{2} \operatorname{lg}(\alpha_1 - \frac{\varepsilon + \delta}{2})$$

(α_1' is the angle of the first refraction); then the refraction law:

$$n = \frac{\sin \alpha_1}{\sin \alpha_1'}$$

is employed.

Minimum Deviation

In practice, it is often desired to select values for the incidence and exit angles in order to simplify measurement and calculation.

The most usual method is to make both angles equal to each other, so that the path of the light rays through the prism is symmetrical. This condition will be obtained when the deviation angle δ is as small as possible. The image of collimator slit, deviated by the prism, is observed through the telescope while turning the prism until the minimum amount of deviation is observed. The deviation δ is then measured. Since $\alpha_1 = \alpha_2$, the formula can be simplified.

Cont. page 2

Testing Lenses, cont. from page 1

$$n = \frac{\sin \frac{\pi + \delta}{2}}{\sin \frac{\pi}{2}}$$

Perpendicular Incidence

In addition, the light rays may be directed so that they enter or leave the prism at right angles to its surface (Fig. 2). In this event:

$$n = \frac{\sin \alpha_2}{\sin \pi}, \alpha_2 = 0^\circ$$

$$\text{bzw. } n = \frac{\sin \alpha_1}{\sin \pi}, \alpha_1 = 0^\circ$$

Oblique Incidence or Critical Angle of Total Reflection.

A third possibility is to arrange matters so that one of the two angles is as much as 90° , so that incident or emergent rays make a very shallow angle to the prism surface. In this case a broad slit is used, and the obliquely-adjusted cross-hair is focused on the light-dark boundary, which narrows the image of the slit (Fig. 3). Of course, in the case of oblique emergent rays, one would not employ the emergent rays themselves, but would rather work on the critical angle of total reflection (Fig. 4).

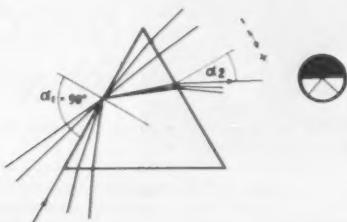


Fig. 3 Measuring the refractive index of glass from the deviation angle δ of a prism, when the ray is parallel to the first surface or strikes it at a shallow angle; $\alpha_1 = 90^\circ$

General

The oblique-incidence or critical-angle of total reflection methods are also used with the most commonly used refractometers. These have a lower measuring accuracy but permit faster working. Moreover, a much smaller glass sample is required, on which only a right-angle

or even a plane surface need be worked. The refractometer employs a fixed measuring prism, the exact specification of which is known. The plane surface of the glass sample is then placed on the measuring prism with a suitable contact fluid between them. The critical angle of refraction is then used to compute the refractive index of the glass sample (n) when the light ray passes from the sample to the measuring prism with its known refractive index $N_0 > n$.

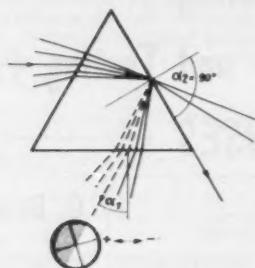


Fig. 4 Measuring the refractive index of glass by means of the critical angle of total reflection for a prism; $\alpha_1 = 90^\circ$.

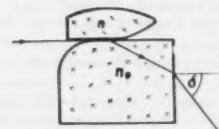


Fig. 5 Measuring system with Pulfrich refractometer.

Pulfrich Refractometer

In the Pulfrich refractometer (Fig. 5), the light from a discharge lamp enters along the boundary surface, and the angle δ of total deviation is measured. The sample must be ground to a right angle. For greater convenience in viewing, the telescope is placed parallel to rotation axis of the graduated dial; a mirror inclined at 45° is placed in front of the telescope. To simplify calculation, tables are enclosed giving the refractive index n for each angle δ .

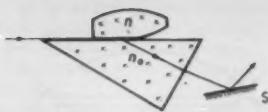


Fig. 6 Measuring system with Abbe refractometer, measurement by transcent light.

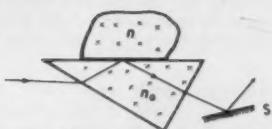


Fig. 7 Measuring system with Abbe refractometer, measuring with the aid of the critical angle of total reflection.

Abbe Refractometer

The Abbe refractometer works on the same principle, but the measuring prism is of a slightly different shape. In the latest models, the telescope is rigid, and the light travels via a mirror, while the telescope is perpendicular to the axis of rotation. The alignment of the cross-hairs relative to the dark-boundary is obtained by rotating the mirror; its position gives the value of the deviation δ . The refractive index is then read directly off the scale. With the Abbe refractometer it is possible to work with transcent light (Fig. 6) and with light reflected at the boundary surface (Fig. 7). In the latter case the sample to be measured need only have one surface ground plane. For illumination with this device, daylight or incandescent light is adequate. Two direct-vision Amici dispersion prisms, which can be rotated relative to each other, are fitted in the telescope. They should only be rotated sufficiently to cause the initially coloured dark boundary to appear colourless. From the setting of the compensators, it is moreover possible to determine the Abbe number v_d of the glass.

Refractive Index of a Lens

There also exist methods of determining the refractive index of a lens without grinding and thus destroying it.

For this the most suitable equipment is an auto-collimation telescope, carefully focused free from parallax, and a good-quality surface-silvered mirror (Fig. 8). In the path of the rays between the lens and the mirror is placed a cuvette with plane-parallel sides; this will not

alter the focusing of the telescope. Then the lens to be measured is introduced into the cuvette and placed in the beam of rays, so that the auto-collimator image disappears. When the cuvette is

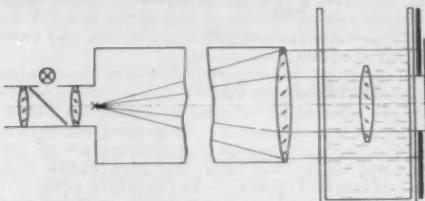


Fig. 8 Method for determining the refractive index of a lens without grinding it.

then filled with a liquid which has exactly the same refractive index as the lens, so that the lens is in contact with the fluid on every side, the original conditions are restored. A fluid of suitable refractive index can be prepared by mixing two different liquids, one with a higher refractive index than the glass and one with a lower index. This should be done by observing closely while slowly pouring first one fluid and then the other into the cuvette. Eventually the auto-collimator image will reappear, free from parallax. The refractive index of the mixture of fluids should then be measured; the index of the glass of which the lens is made will be identical.

Accuracy of these Techniques

The accuracy of measurement is greatest with the minimum-deviation processes; the degree of error should be a unit of the fifth decimal place or less. With the Abbe refractometer an error of two units of the fourth decimal place may be expected, and with the Pulfrich refractometer one unit of the fourth decimal place or less. An inaccuracy of one unit of the fourth decimal place may occur when measuring a lens by the auto-collimation method in fluid.

Measuring the Radii of Curvature

General

There are three fundamentally different techniques for measuring the radii of curvature of lens surfaces:

1. Mechanical
2. Geometric-optical and
3. Optical interference methods.

For absolute measurements, techniques belonging to the first group are principally used, while for comparative measurements the test-glass method, which belongs to the third group,

Cont. page 4

Testing Lenses, cont. from page 3
 yields results of exceptional accuracy. In the test-glass method, the curvature of the lens surface is checked by placing a glass with identical but reversed curvature on top of the lens. If interference phenomena are visible, the two radii are not absolutely identical.

The exceptional accuracy of this method makes it improbable that variations in the radii greater than are admissible will occur during the manufacture of lens elements. This does not necessarily imply that the radii of curvature are of the specified value, but only that they agree with those of the test-glass. It is therefore most essential that the test-glass must first be measured with great care, by one of the other testing techniques.

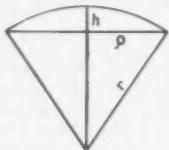


Fig. 9 Relationship between the radius q of the spherometer ring, the meniscus height h and the radius r of the lens surface.

Mechanical Methods

The varieties of apparatus used in testing procedures of this group include the various forms of spherometer. The principle of spherometry consists in measuring the meniscus height of a spherical segment or cap (Fig. 9). From this, the radius of curvature r of the spherical surface can be calculated, provided that the radius q of the base of the cap is known. The radius of curvature to be determined is then:

$$r = \frac{q^2}{2h} + \frac{h}{2}$$

There are various types of spherometer available, according to the degree of accuracy desired. The most accurate is the ring spherometer, with which the radius q can be obtained from one of the two clear-cut edges of the ring (Fig. 10). When measuring convex surfaces, the lens is laid upon the inner edge of the ring, and when measuring concave surfaces upon the outer edge. A movable measuring pin is fitted at the axis of the ring, the setting of which can be read off. In large versions of this apparatus, the rings are interchangeable, so that lenses of the widest range of diameter can be accommodated.

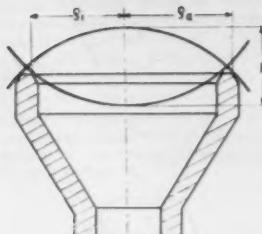


Fig. 10 Measuring the radii of curvature of a pair of test-glasses by means of a ring spherometer.



Fig. 11 Arrangement of the points in a three-point spherometer.

In simpler devices, the ring is replaced by three fixed measuring pins or points, which together form the corners of an equilateral triangle (Fig. 11). The distance s between two points must be measured accurately, which makes it possible to calculate the radius q of the base of the spherical segment,

$$q = \frac{s}{3} \sqrt{3}$$

and from this the radius of curvature.

$$r = \frac{s^2}{6h} + \frac{h}{2}$$

Even simpler equipment employs only two fixed points: it is therefore possible only to measure in one plane. When measuring, care must be taken to ensure that this plane is perpendicular to the surface of the lens. This device has the advantage, however, that it can be used for measuring the curvature radii of cylindrical surfaces. This "pocket spherometer" or "dioptric gauge" is used particularly for the measurement of spectacle lenses. It gives directly the refractive power of a single surface in dioptres, from which the refractive index of the glass in question can be deduced thus, $n_d = 1.523$.

(Cont. next issue)

Measuring and Testing Lenses is from
 HAUSMITTEILUNGEN, JOS. SCHNEIDER &
 CO., OPTISCHE WERKE, Kreuznach, Germany

Voigtlander, cont. from page 10
1956 had a greater significance to the Voigtlander plant than the production of lens number 4,000,000 (a 50-mm., f/1.5 Nokton). It was also the 100 year jubilee of the company.

In the four years since 1956, Voigtlander has produced a million lenses and set another record as well. In June, 1958, the company produced Color-Skopar number 1,000,000. This lens was first produced in 1949 and began the line of latest Voigtlander high-speed objectives.

Camera News of West Germany, Dec. 1960



VOIGTLANDER LENSES

Another Breakthrough For Dr. Land

By Dr. Louis Walton Sipley, Director,
American Museum of Photography, re-
printed from Photographic Trade News,
February 13, 1961.

Occasionally something comes along which is a bit off the beaten track and arouses more than usual interest or curiosity. In the field of photography, Dr. Edwin Land and his Polaroid organization have been unique in the ability of advancing revolutionary ideas or bringing old ideas into line with modern settings. A U.S. patent which was granted near the close of 1960 to Dr. Land and assigned to Polaroid belongs in this category. The title of the patent is Cinematographic Method and Apparatus. It is U.S. Number 2,950,644.

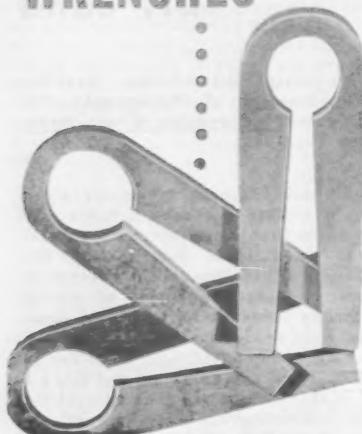
Premise for Development

The premise on which this method was developed is that "Motion picture scenes are of a finite duration and it has been found that for most practical purposes, the duration of a scene may be, for example, of the order of five seconds." With this idea in mind the inventor has worked out a method of recording on a frame or slide, measuring 1-1/2 x 2-1/4 inches, a series of exposures equivalent to those made in five seconds on substandard size motion film such as 8mm film which is normally exposed and projected at 16 frames per second. This photographic film is described as being "a transparent film or layer - having a surface which is goffered with a gridlike arrangement of a multiplicity of minute optical elements, preferably generally spherical lenticules, with a photosensitive emulsion layer disposed immediately adjacent or formed integrally with the lenticulated film."

Cont. page 18

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BOOK REVIEW

One of the most complete glossaries of words and terms used in the photographic field is The ABC's of Camera Repair by S. L. Love.

This book serves as a dictionary for the camera repairman, photographer, or anyone interested in the photographic field. Containing over 2,500 entries, The ABC's of Camera Repair covers the terminology of the photographic field. Intended to be used as a handbook, excessive bulk has been eliminated by limiting definitions to the photographic applications of the word or term defined. This book provides an easy means of ascertaining correct terminology for the executive, engineer, or supervisor of work involving photography.

To illustrate, using a general dictionary, the word "shutter" is defined: 1. One who or that which shuts. 2. A movable cover or screen for a window; a blind. 3. Photog. A mechanical device of various forms, attached to a camera for opening and closing to expose the film or plate.

In The ABC's of Camera Repair "shutter" is defined as: A mechanical device which regulates the time that light is allowed to pass through it. Some thirty-one different types of shutters are listed, such as:

Shutter, barrel-type: a rotating shutter generally used in motion picture equipment. Rotating on an axis which is perpendicular to the axis of the lens, the shutter passes light when two diametrically opposite openings are simultaneously aligned with the lens axis.

Shutter, focal plane: a shutter operating close to the film. Generally, the type of shutter that exposes the film progressively by passing an aperture close to and across the face of the focal plane; sometimes called a back or curtain shutter.

Shutter, multi-bladed: a shutter having three or more blades each pivoting from a point around the circumference of the aperture. Generally a between-the-lens type, such shutters have several similar blades as differing from the sliding door action found in double bladed shutters.

For salespeople this glossary will prove an invaluable aid in answering customer questions and explaining technical features of cameras and other related equipment.

The ABC's of Camera Repair, 84 pages, NCPS Press, Box 174, Englewood, Colorado. \$3.95.-F. Platts

Your ServiShops

QUESTIONS...

By Clair Schmitt, Editor



? ? ? ? ? NEED HELP ? ? ? ? ?

Send your camera repair questions to the editor. You will receive a prompt reply. Names will be withheld if requested. Address your questions to: Editor, The Camera Craftsman, Box 174C, Englewood, Colorado

Will installation of flash synchronization on an Argus C-2 camera synchronize the shutter for flash bulbs at 1/25 second speed setting and for electronic flash at all speed settings—or does it involve the additional work of electronic flash conversion? Would an adjustable mechanical tripper, screwing into the cable release socket, be satisfactory?

Walter J. Husband

Synchronization could be installed for flash bulbs at 1/25 sec. or slower, and it would also be possible to use electronic flash at all speed settings with the same installation. However, because of the low trade-in value of the C-2 model, it would not be considered economical to install internal contacts. An adjustable mechanical tripper such as you mentioned could be used satisfactorily but, of course, would not be as dependable as the internal contacts. In this case though it would be the most economical means of synchronizing the camera for flash.

I am replacing the ground glass back in a 4 x 5 press camera. I have cut the glass to size, but the edges are very sharp and I wonder if there is any way to smooth the edges of glass after cutting it?

Paul Thomas

The sharp edges of glass can usually be rounded or smoothed by using a felt wheel on a stand, hand drill, or flexible shaft machine. A buffing compound of three parts of No. 3 pumice powder and one part of aluminum oxide (a coarse, unfused powder) is recommended.

A thin paste is made of the compound by adding equal measures of glycerine and denatured alcohol. The compound is then used on the buffing wheel to buff the edges of the glass. Care should be exercised to use smooth strokes in the buffing operation.

HELP WANTED

A card to NCRS Placement Service will bring more details about these opportunities. Include code number listed for opening that interests you

01114 Need a good camera repairman to join our company and set-up a repair department or would consider financial support for a camera repairman wishing to start independent shop. Jacksonville, Florida.

0728 Repairman wanted to take full charge of repairs on photographic equipment. Must be able to repair all types of equipment. Tucson, Arizona.

01214 Please furnish us with the name, address, and telephone number of any of your graduates who live in the Pittsburgh, Pa. area and are available for employment. We are willing to consider an advanced student.

0817 Additional camera repairman needed for large centrally located, repair shop. Desire graduate of National Camera Repair School, Detroit, Mich.

088 Want good repairman for our shop. Real opportunity for the right man. San Francisco, California.

121 Our company would appreciate applications from graduates of National Camera Repair School North Hollywood, California.

01010 Well equipped modern shop needs two camera repairmen. Out-of-town inquiries invited. Top wages. New York, N.Y.

01011 Jacksonville, Florida firm needs experienced, bondable repairman to specialize in tape recorders and 16 mm sound projectors. Will consider someone willing to relocate.

01010 Established camera store in Farmingham, Mass. with growing repair department wishes to employ an additional camera repairman able to handle the more complicated types of repair work. Pay commensurate with ability.

138 Motion picture camera repairman needed who has had experience on Mitchells, Bell and Howell, and Arriflex cameras. Our business is primarily in the motion picture field and we would want a man willing to specialize in this field.

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Lindstrom



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Bright finish	\$2.25	\$2.25	\$2.55	\$2.80



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Size	3 1/2"	4"	4 1/2"	5"
Bright finish for jaws	\$1.95	\$2.05	\$2.25	\$2.50



CHAIN NOSE PLIERS

Size	3 1/2"	4"	4 1/2"	5"
Bright finish, Cut jaws	\$1.95	\$2.05	\$2.15	\$2.25
Bright finish, Sec. jaws	1.95	1.95	2.00	2.15



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Hi There!

from Jan VanderBeek

We have had a few new faces around here lately. Two more additions to our "family" at NCRS and a couple of visiting students.

We have a new printer, who with all the revisions in text books, is swamped. His name is John Goldsmith and he use to have his own photo shop in Brighton, Colorado.

Then there's Richard Rae and believe me when he and George get together, things start flying! Work as well as a lot of kidding.

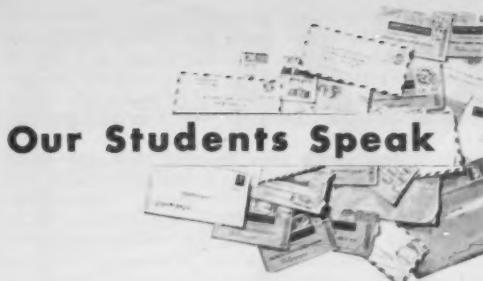
Jimmie Luth of Visalia, California, a graduate, visited us for a couple of weeks and we had a few discussions about Colorado and California. Of course we convinced him Colorado was "it". Incidentally, he is opening up a ServiShop in Visalia.

Mr. Manfred Sande From Fargo, North Dakota also spent a week or so with us during a slack season at home. A student, he is already working on cameras besides his studies. We must have high admiration for these ambitious people. On his way to Korea, Walter Pomper stopped in to say "Hello" and ask a few questions about a lesson. He is one of the many service men enrolled in the course. We sure enjoy these visits with our students and anyone else who is interested in Camera repair.

Just the other day we got the happy news NCRS may soon have a new building. Granted, we are like a happy family, but once in a while its nice to be able to stretch. This shows progress and a lot of work on everyone's part!

Mr. Love and Mr. Schmitt were in Philadelphia for the MPDFA convention and were pleased to see so many students and visitors at the NCRS booth. The new Motion Analyzer was sort of the star of our show.

Aren't we all happy that spring is just around the corner, some flowers are blooming already and the weather is getting warmer (to stay) and I believe I detect a few spring clothes out already too. Also, we have a horse-shoe court out in the back of the building, and it has been used already during the lunch hour. So, we leave you again with this pleasant thought, and "we'll be seeing you."



Our Students Speak

As a fairly new student I just had to take time out to write you a letter for a friendly little chat. I sincerely meant to write sooner, but have been quite busy with my studies. Please forgive me.

When I first joined, many of you wrote personally and congratulated me as the newest member of the NCRS family. It was deeply appreciated and I couldn't help but feel right at home. Every one of you seems so eager to help, and a congenial group to work with. So now you understand why I just had to write....

The lessons are easily written and understood, and are getting more interesting with each one. I recommend the course highly to anyone.

I received the Jan. - Feb. edition of the Camera Craftsman last week, and thoroughly enjoyed reading it. It not only gives the latest news, but also helpful information applying to the course. Tell Jan VanderBeek I enjoyed reading her column. She seems to be a wonderful person with a great sense of humor.

Harry W. James
Alexandria, Virginia

I received my corrected lesson this morning and I never cease to be amazed at the results. A lot of credit is due the school for without the clear easy to understand texts and expert instruction, and the collection of very fine tools to work with, such grades would not be possible.

Russ Phillips
Auburn, Washington

I believe that this lesson (Multiple Speed Shutters) has been the most interesting so far and the most enlightening also. To say the least I am enjoying the course very much and am realizing my investment back already.

M. F. Kruger
Norfolk 2, Va.

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Front panel slides underneath drawers when box is in use -- friction catch holds it there. Fits outside, holding drawers closed for carrying (locks with lid lock). Bright zinc plated fittings make attractive combination with brown rippled baked enamel finish. Dimensions: 20 x 8-1/2 x 13" Weight 27-3/4 lbs.

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Four Drawers	8-5/8 x 7-1/2 x 1
One Drawer	8-5/8 x 7-1/2 x 2
One Drawer	18-1/4 x 7-1/2 x 1-1/2
Bottom Drawer	18-1/4 x 7-1/2 x 2-1/2

MODEL 520 \$31.95

The #620 chest has the same rugged construction and time-saving convenience features as the #520 described above. Equipped with three drawers -- top one has four adjustable partitions. Dimensions: 20 x 8-1/2 x 13" Weight 26 lbs.



MODEL 620

\$25.95

Till in Top	20 x 8-3/8 x 3-1/4
Top Drawer	18-1/4 x 7-1/2 x 1-3/8
Middle Drawer	18-1/4 x 7-1/2 x 2-3/8
Bottom Drawer	18-1/4 x 7-1/2 x 3-1/4

A ServiShops PRODUCT

Dr. Land, cont. from page 13

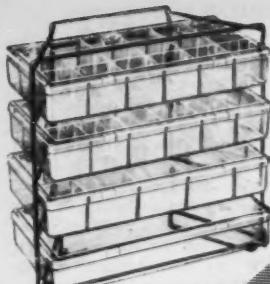
In exposing this film to form sequential latent images of the scene being recorded, the "locus of the 'taking' light emanating from the camera lens is shifted or moved with respect to the film assemblage in a pattern so that each lenticule images the light from the lens on a different area underlying each lenticule. A succession of images is thus formed in a pattern of components corresponding to and underlying the lenticules," and each of these successive images may be projected or viewed by methods which are the reverse of the taking process. The inventor states that this is accomplished in a hand held camera and completely processed in the camera. The statement is also made that these images may be recorded in a spiral pattern or in concentric circles.

If this idea may be difficult to grasp, the reader is referred to the Briggs "Dancing Skeleton" which had six sequential images on one mica slide, or the projecting "Zoetrope" which used 13 images, or the later work of Muybridge in America and Marey in France. In the disclosure, the inventor has gone into detail concerning the use of a set of tri-color filters to both take and project these pictures. However since the time the patent papers were filed, Dr. Land has made major news through advancing a new theory of color by projected images taken through red and green filters only and projected with only one color and white light. Perhaps in view of these later ideas this patent might be modified by changing the three color filters to two for taking and one for viewing. At least it should stimulate some conjecture. Photographic Trade News, Feb. 13, 61.

Former U. S. Commissioner of Education, Dr. Lawrence G. Derthick, is now assistant executive secretary at the National Education Association. Dr. Derthick is also a member of the National Home Study Council accreditation board.

National Camera Repair School, Englewood, Colorado, publishers of The Camera Craftsman, is accredited with National Home Study Council.

Recently, an essay contest was held to find the outstanding example of procrastination. The winning entry consisted of just four words... "I'll write it tomorrow!"



(a \$3.95 value)

~~Kits~~
~~Kits~~
~~Kits~~

You've asked for them and here they are!



KITS NOW AVAILABLE:

* When TransRak is not ordered, these kits include a P 201 Plastic tray for storing.

*RIVET ASSORTMENT	\$7.50
*WIND ASSEMBLY ASSORTMENTS	
For Box Camera	\$6.95
For Popular Priced Folding Camera	\$6.95
*SYNCH INSTALLATION KITS	
External (Connectors, Insulators, etc.)	\$9.75
Internal (Replacement Parts, contact material, etc.)	\$15.50
*SHUTTER BLADE ASSORTMENT	\$6.95
FLASHCORD ASSORTMENT (6 cords)	\$9.90
SPRING WIRE KIT assorted sizes	
from .005" to .015"	\$1.00
METRIC SCREW ASSORTMENT (400 pieces)	\$7.50
MIRROR ASSORTMENT (6)	\$5.95

~~1/4 PRICE! YOUR TRANS-RAK, SHOWN ABOVE,
COSTS YOU ONLY \$1.00 WITH ANY ServiShops
KIT ORDER TOTALING \$20.00 OR MORE.~~



Tap-A-Line

IN YOUR WORKSHOP: Tap-A-Line permits you to plug in soldering irons, test lamps, flex shaft, other equipment. Has them all ready and available for immediate use.

IN YOUR STUDIO: Tap-A-Line is convenient for portable lights, flood lights, spot lights.

On Your Test Bench: Tap-A-Line will permit you to plug in all types of flash cords and have them at your finger tips.

Model TL 1 foot

\$2.00

Dixon Miniaturized Tools

You've seen handy screwholding drivers for the auto trade... here's a miniature that's terrific in instrument and camera work. The jaws adjust automatically to hold screw straight and securely — no more stripped threads or lost screws. Ends awkward groping in hard to reach places. Set screw locks screw holder at any setting. Tape streamlining of screwholder section helps you get into tight places.

\$3.40

Knurled
Nickel
Plated
Handles



A companion miniaturized tool! The right tool for the job is essential in camera repair. This miniature Hand Drill eliminates fumbling with tools too large and bulky for precision work. Accommodates drills or tops in sizes 50 to 80 or twist drill gauge. You'll find it indispensable in your well equipped shop. \$3.50

▲ ServiShops PRODUCT

NEW WEST GERMAN SHUTTERS

Three new West German shutters, recently introduced, are the Compur-Automat, the Pronotomat-S, and the Prontor-Lux. The latter two are products of Alfred Gauthier, and the former of Compur-Werk.

The new shutters are logical refinements and developments of the Deckel Compur and Gauthier Pronotomat mechanisms. Both manufacturers utilize a new principle in the design of their new mechanisms. The energy for the automatic exposure setting is not supplied by the exposure meter's photo cell, but by the action of the photographer in cocking the shutter and pressing the shutter release.

The mechanisms of both manufacturers can be operated either automatically or manually, a feature that will particularly interest the advanced amateur and professional photographer. Many previous, automatic mechanisms did not permit manual change of shutter speed and lens aperture.

The first West German camera with the new Compur shutter to be introduced here probably will be the Super Baldamatic.

Coaches give last minute instructions before sending a new man into the game, and so do sales managers. A salesman was telling us how he got started in his territory some six years ago.

"I went into the sales manager's office the morning I was to leave, more than a little scared, for this was to be my first selling experience on my own. I expected quite a lecture on what I should and should not do, but I found the sales manager was about to take off on a trip himself, and had little time for much of a lecture.

"Perhaps it was a good thing, for I remember every word of what he said, and I attribute whatever success I have had in selling to following his advice. 'Bill,' he said, 'you go out and make friends.'"

SPECIAL OFFER WHILE THEY LAST

Miscellaneous parts for Ansco cameras. Thirty or thirty-five assorted items in a package. Lenses, retainers, screws, leatherette covering, etc. Each item identified by manufacturer's number.

Regular Price \$10.80
While They Last \$ 6.95

ServiShops Supply
Box 174, Englewood, Colo.



BELLows

Have we heard from
you lately?

I would like to swap the following:

5 x 7 Eastman 33A view camera with 190mm f:3.5 Zeiss Tessar lens in Ilex Universal #5 shutter (synchronized for zero delay) for:

7-1/2" (190-195mm f:4.5 or 6.3 lens in a Compur shutter having X delay).

What I offer is in excellent shape except 3.5 Zeiss lens isn't coated; however, I do not need the bulk that the 3.5 offers, and want to work on a project of a 4 x 5 twin-lens reflex. If some reader or student may be interested, I can be reached at address below.

Thomas Warren CTC USN
USN Radio Station
Skaggs Island
SONOMA, California

My preference is a combination repair operation. Giving the established firms a discount and charging same at my shop as the other firms. Stand firmly behind every job regardless of how large or small with no argument or red tape. Giving every customer, no matter how expensive or inexpensive his equipment, all the help and information I am capable of giving. I have already learned that, if a person treats his customers right and takes care of them, they will do the same in return and you have a life long customer. Price all jobs uniformly. A repair shop has to be efficient to be successful. I feel that the training given by NCRS is complete in every way and prepares him for camera repair in every way, the training is the best. It gives a student confidence for any phase of the work.

Doyce E. Croy
Comanche, Oklahoma



You will work better when you see better with this new Binocular Magnifier. May be worn with or without eyeglasses. It is simple to wear. Repairs and precision work can be done easier, faster and more accurately using this equipment. With the Magni-Focuser you see an object in third dimension greatly magnified - with depth and clarity. It reduces eye-strain and prevents squinting - thereby saving time, increasing accuracy and minimizing the chance of errors and accidents. The head-band is adjustable for your comfort. Normal vision may be resumed by slightly raising your head.

Model No	2 magnifies 1-1/2 times at 20"	Price
3	1-3/4	14"
7	2-3/4	8"
10	3-1/2	4"
		10.50
		10.50
		12.50

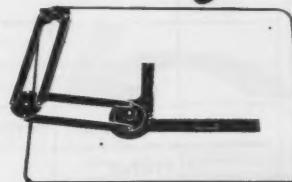
No 13 and 17 are the same as No 3 and 7 with an auxiliary lens attachment which gives magnification of 4-1/4 and 5-1/4 respectively, with the right eye only. Priced \$15.00 each.

draftette®

Complete with 10" x 13" drawing board . . . \$5.95
Draftette instrument only \$4.95
(Scale 3" x 5" - 6" arms - 180 degree protractor, Draftette completely assembled - ready for use.)

Draftette with 4" x 6" scale and 11" x 17" Drawing board - Complete \$8.50
Draftette 4" x 6" scale alone \$2.00

draftette®
Complete with 11" x 17"
drawing board only **\$6.50**



NATIONAL CAMERA ServiShops
Box 174 • Englewood, Colorado

SERVISHOP PRODUCT GUARANTEE

When you purchase a ServiShops product, you are sure you're getting the best of equipment. Every product advertised in the Camera Craftsman carries three warranties.

First, you have a ten-day return for refund privilege. If, for any reason, you're not satisfied, you can return your order within 10 days of purchase, for a full refund.

Second, all materials and workmanship of NCRS manufactured products are guaranteed by NCRS for one full year. NCRS will replace any parts or components which might become defective in normal use, if returned to the factory, transportation charges prepaid, within one year of original purchase.

Third, all products and parts handled by NCRS are guaranteed by the individual manufacturers of those products.

National Camera Repair School further guarantees to check and service any ServiShops product no longer within the warranty period, at nominal charge.

NCRS ORDER BLANK

Date 19

You can order any product advertised in the Camera Craftsman. All products carry the NCRS Return Privilege Guarantee -- Satisfaction or return in 10 days for complete refund!

Shipments are F.O.B. Englewood (Denver), Colo.

Acct. No. _____

How shall we ship? How will you pay?

Name _____

Parcel Post Cash

Street _____

Railway Express C.O.D.

City _____ State _____

Other _____

Other _____

Quantity

Name and Description

Price

	minimum Postage	.30
	Total	

Minimum Order - \$2.00

Signature _____



NCRS BOOTH A BUSY PLACE

The National Camera Repair School Booth at the MPDFA Trade Show in Philadelphia was crowded most of the time.

Photo dealers, manufacturers representatives, camera repairmen, professional photographers, and NCRS students came to see the test instruments and shop tools demonstrated. The ServiShops Motion Analyzers were operating constantly, showing shutter speeds, synchronization, frame speeds and contact operation of all types of still and motion picture equipment.

The new ServiShops Auto-Collimator interested many with its easy method of checking focus at all distances. The Unimat and other tools also drew a lot of attention.

Besides the opportunity to meet so many of our friends and demonstrate the instruments and tools, the chance to chat and discuss Camera Repair was an important part of the show. Getting together like this is valuable to everyone and we want to thank all who were there for dropping by the NCRS Booth.

If you weren't able to make it this year, perhaps we'll see you in Chicago in 1962.



NATIONAL CAMERA REPAIR SCHOOL

Box 174
Englewood, Colorado

I am interested in the opportunities and advantages of a career in Camera Craftsmanship. Please furnish me with complete information about your training program.

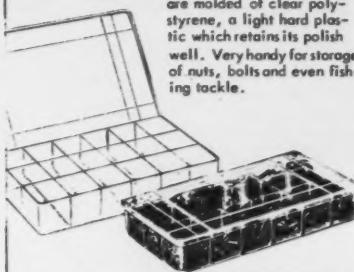
Name _____ Age _____

Street _____

City _____ State _____

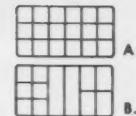
Handy PLASTIC BOXES

These crystal-clear boxes, 8-1/4" x 4-1/4" x 1-1/4" are molded of clear polystyrene, a light hard plastic which retains its polish well. Very handy for storage of nuts, bolts and even fishing tackle.



3 for \$2.00

75¢ each



Please designate type desired.

Order from:

NATIONAL CAMERA **ServiShops**
SUPPLY

Box 174 • Englewood, Colorado



If you have a friend or relative who may be interested in the money making opportunities that exist today in the camera repair field, have him or her fill out this coupon and mail it to the National Camera Repair School, Box 174, Englewood, Colorado.

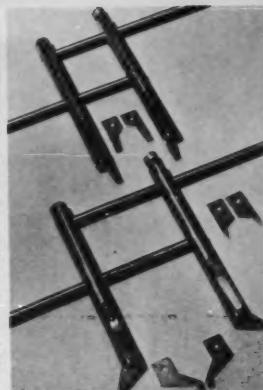
751-1

MULTISPAN WRENCH

\$8.50

Here is the precision spanner wrench designed especially for optical and camera work. It will serve you economically, for the tool accepts replaceable and interchangeable tips. Quickly adjustable from 0" to 4" (even more with proper tips), you lock the setting firmly with a single motion. The MultiSpan's versatility is unmatched because of the many varieties of tips you can use. You can instantly snap a tip for almost any application into one of two positions. Get a complete set of tips which you can use in pairs or in combination with each other.

Blanks with the tip unground are also available. These tips are already heat treated, and plated. You can grind the blade to the required shape for many of the hard-to-get-at retaining rings. Prices shown are per pair.



751-2 Tips, straight, flat, ground 1.60
751-3 Tips, straight, pencil point 1.60
751-4 1/8" offset, flat, ground 1.80
751-5 1/4" offset, flat, ground 1.80
751-6 3/8" offset, flat, ground 1.80

751-2u Tips, straight, flat, unground 1.30
751-3u Tips, straight, point, unground 1.30
751-4u Tips, 1/8" offset, flat unground 1.50
751-5u Tips, 1/4" offset, flat unground 1.50
751-6u Tips, 3/8" offset, flat unground 1.50

751-15 A Special Spanner Wrench for removing narrow shutter retaining rings on the Retina and Karat cameras



\$8.50

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South St. Paul, Minn.

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